

# True Genesis of Distinctive Gait Associated with Aging Suggests Novel Approach to Addressing Geriatric Balance Issues

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## Introduction

Without being able to see an individual's face to look for signs of agedness, human beings instinctively know how estimate the age of an individual through analysis of their stride. While it is widely believed that a "geriatric stride" is the result of stiff muscles, arthritic joints or reduced cardio-pulmonary capacity, the fact that geriatrics in top physical condition sc. marathon runners can be identified by gait alone suggests that another factor is at play. Understanding this unidentified factor could point in the direction of a novel approach to addressing age-related balance issues.

## Abstract

Throughout the development process of the brain as well as the aging process, the pattern of function of the brain has great plasticity, enabling it to adapt in the event of damage to parts of the brain as well as enabling the brain to be re-trained to to perform new tasks should the situation call for it.

While general areas of the brain have been associated with the performance of specific tasks and while it is true that areas such as the motor cortex are in the same general part of the brain from one individual to the next, the functional "center of gravity" of each of these functional zones may be distinct from one individual to the next and while these zones may be located in nearly the same areas in individuals of the same age, these zones may migrate with age, as may their mode of function.

In the case of the motor cortex, fMRI data tells us a fair bit about the physical areas of the brain in which motor control activities are transpiring, but tells us little about how this region of the brain either filters or accepts sensory inputs. The brain is capable of "tuning out" redundant or irrelevant information and it would, therefore, make sense if it were to be found that this filtering of certain information were also taking place with regard to sensory inputs from the inner ear, for example, as interpreted by the motor cortex.

In early development; prior to a child becoming ambulatory; the entire focus of the motor cortex with regard to maintaining balance revolves around stabilization of the head and the eyes. During the toddling stage of development, a child will, even as they trip and fall, strive to keep their eyes and head stable rather than attempting to break their fall with their arms. When this tendency is overcome and when gait becomes more natural, toddlerhood is considered to have been surpassed.

During the next phase of development, it has been observed that many children do not allow their arms to swing freely while walking. The reason for this is because they are attempting to keep their shoulders level at the expense of not stabilizing their hips (at the true center of gravity.) Eventually, children begin to allow their arms to swing freely and begin aiming for the stabilization of the hips rather than the head or shoulders.

Given that this is the case, it stands to reason that as an individual advances in age and becomes geriatric, a substantial factor in what makes their gait so readily identifiable as a "geriatric gait" is the progressive regression of the unconscious tendency of the motor cortex to attempt to stabilize gait at physical points that are progressively lower, with the motor cortex, in some cases, attempting only to stabilize the lower legs and disregarding sensory inputs concerning the position of the torso and the head, resulting in loss of balance and abnormal gait.

So long as the inner ear is functioning properly (and it is in most geriatrics,) the information needed to correct gait, bringing it into conformity with that of a younger person would logically continue to be generated by the inner ear and presented to the motor cortex, leaving the only plausible explanation for these sorts of gait anomalies the motor cortex's ignorance to these signals rather than the absence of signals from the inner ear, as is frequently cited as a source of balance issues.

Provided that these signals are at least being presented to the motor cortex, it should be possible to re-train the motor cortex to "listen for" these signals and re-prioritize the treatment of the hips as the center of gravity.

## **Conclusion**

Motor cortex-centric neuroplasticity exercises such as providing active tactile feedback to patients with balance issues as they walk on a treadmill could improve the functionality of the motor cortex and aid in correcting certain types of balance issues in geriatric patients.